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AWWA WEBCAST PROGRAM

Chlorine Gas: Balancing Public Health and Security

An AWWA Webcast August 20, 2008

1:00 – 2:30 p.m. Eastern Time
12:00 – 1:30 p.m. Central Time
11:00 a.m. – 12:30 p.m. Mountain Time
10:00 – 11:30 a.m. Pacific Time

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Panel of Experts

Bill Desing, P.E.
Senior Technologist
CH2M Hill Water Group

Paul Kinshella, P.E.
Treatment Plant Engineering Superintendent
City of Phoenix

Scott Dewhirst, P.E.
Chief of Facilities Engineering
Newport News Water Works

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Ask the Experts


Bill Desing


Paul Kinshella


Scott Dewhirst


Bill Bellamy

E-mail your question with your first name, city and state to online@awwa.org.

Please specify to whom you are addressing the question.

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Agenda

- Welcome!
- Guide to Evaluating and Selecting Disinfection in a Security-Conscious Environment
- City of Phoenix Case Study
- Newport News Water Works- Conversion to Hypochlorite
- Question & Answer Session

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Welcome!

Tommy Holmes
Legislative Director
American Water Works Association

Chlorine Gas: The Policy Environment

- What is the current federal policy?
- What can we expect in the near future?
- Understanding policy discussion will help your own planning

Those Washington Acronyms

- CFATS – Chemical Facility Anti-Terrorism Standards
- DHS – Department of Homeland Security
- Energy & Commerce – House Committee on Energy and Commerce (House committee with jurisdiction over drinking water issues)
- EPA – U.S. Environmental Protection Agency
- Homeland Security Committee – House Committee on Homeland Security
- IST – inherently safer technology

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Current Policy

- Congress exempted water utilities from CFATS bill passed in 2007
- Bill aimed at major chemical producers, users
- Regulatory program now under DHS
- CFATS expires fall 2009
- DHS, EPA consider exemption a “gap” in national security
- Gaseous chlorine a longtime target of some interests

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Congress is at Work

- House Homeland Security passed H.R.5577
  - Would make CFATS permanent
  - Would end water utility exemption
  - Broad new powers over utilities at DHS

then…

- Energy & Commerce introduced own bill, H.R.5533
  - Simple bill
  - Would make CFATS permanent
  - Would preserve water utility exemption, but…
  - Committee considering own water security bill

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Legislative Outlook

- Energy & Commerce and Homeland Security committees wrangling over jurisdictions
- Not much time in this Congress for bills to pass
- However, markers are being laid down
- Watch for new bills in 111th Congress
  - Will convene in January 2009
- Senate not active in this debate…yet

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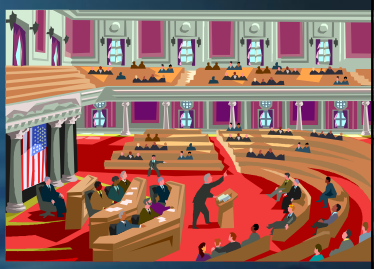
AWWA Concerns

- Broad nature of H.R.5577
- DHS authority to stop operations
  - Water utilities already have plans for when water is unsafe
  - Could administrative violation cause shutdown?
  - What about fire protection?
- DHS authority to order use of IST
  - Choice of disinfection processes must be local



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Chlorine Gas: Balancing Public Health and Security

- So, how do we evaluate disinfection choices?
- How do we secure gaseous chlorine?
- How do we assure the public, and ourselves, that we have studied the issues thoroughly?
- So how do we balance public health and security?

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Guide to Evaluating and Selecting Disinfection in a Security-Conscious Environment

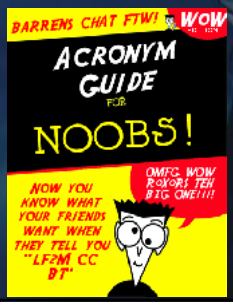
Bill Desing, P.E.
Senior Technologist
CH2M HILL

Presentation Objectives

- Provide overview of Water Industry Technical Action Fund (WITAF) Project # 512 including:
  - Methods for evaluating and selecting disinfection alternatives
  - How to consider security issues in the disinfection decision

Acronyms

- RMP = Risk Management Plan (U.S. EPA)
- PSM = Process Safety Management (OSHA)
- COI = Chemical of Interest
- DBPs = Disinfection Byproducts



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Presentation Outline

- Project purpose and approach
- Evaluation methodology
- Security considerations in the disinfection decision

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Purpose of Guide

- Provide guidance to water and wastewater facilities that use gas disinfection chemicals to evaluate disinfection alternatives considering:
  - Water quality issues
  - The security-conscious environment
  - Several other utility-specific monetary and non-monetary factors

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Project Approach

Guide will:

- Provide science-based, defensible information required to make a decision
- Be practical, easy to use, and applicable for utilities of all sizes
- Be capable of helping address potential future chemical security regulations
- Address local conditions

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Project Approach – Cont.

Guide will be:

- Peer reviewed/tested by utilities
- Formatted for effective, transparent communication to the public
- Applicable to both drinking water and wastewater

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Future Regulations Could Impact Several Chemicals used by Water/Wastewater Facilities

Screening Thresholds for Chemicals of Interest (COI):[1]

- Ammonia (anhydrous) – 10,000 lbs
- Ammonia (liquid) – 20,000 lbs
- Chlorine - 500 lbs
- Chlorine dioxide – 1,000 lbs
- Methane – 10,000 lbs
- Propane – 60,000 lbs
- Sulfur dioxide – 500 lbs
- Hydrogen peroxide – 400 lbs
- Hydrogen sulfide – 45 lbs

Homeland Security

[1] Department of Homeland Security 6 CFR Part 27 Appendix to Chemical Facility Anti-Terrorism Standards; Final Rule; November 20, 2007. Quantities shown are the lowest among all risk categories (e.g., theft, release, etc.)

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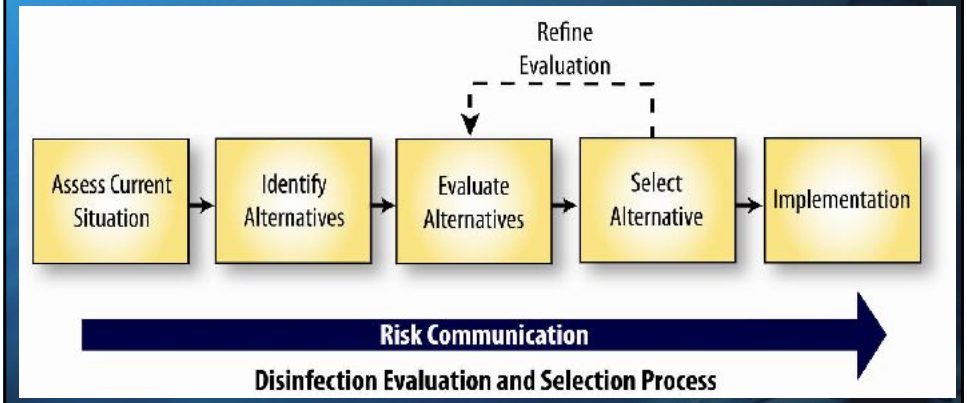
Guide Evaluation Process



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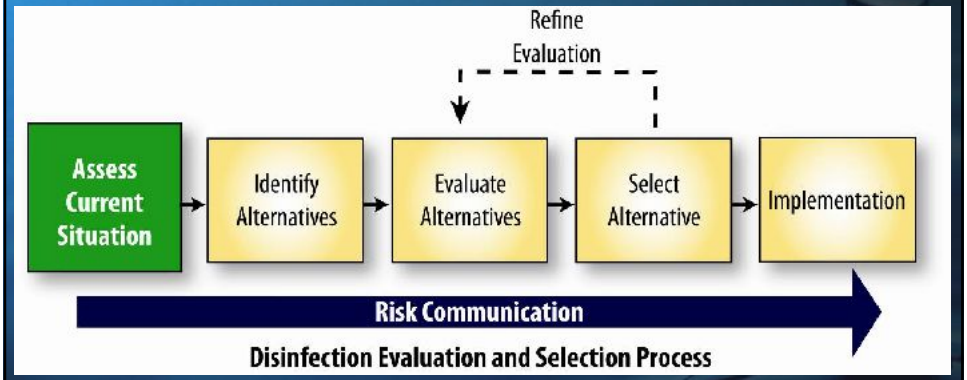
Step 1 – Assess Current Situation



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Step 1 – Assess Current Situation

- **Assess current and future disinfection requirements:**
  - **What are my disinfection objectives?**
    - **Current**
    - **Anticipated future needs/requirements**
      - Drinking water:
        - » Inactivation of *Giardia*, viruses, bacteria, and *Cryptosporidium*
        - » Disinfection byproduct standards
      - Wastewater:
        - » DBPs
        - » Emerging concerns about disinfection effectiveness

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Step 1 – Assess Current Situation

- **Assess:**
  - **Can your existing disinfection system meet your disinfection objectives?**
  - **Safety of existing disinfection systems**
    - **Compliance w/RMP and PSM**
    - **Need for safety improvements – scrubber or other safety improvements**
  - **Security**
    - **Status of implementing recommendations of your vulnerability assessment?**
    - **Determine need for security improvements**
  - **Legal liabilities**

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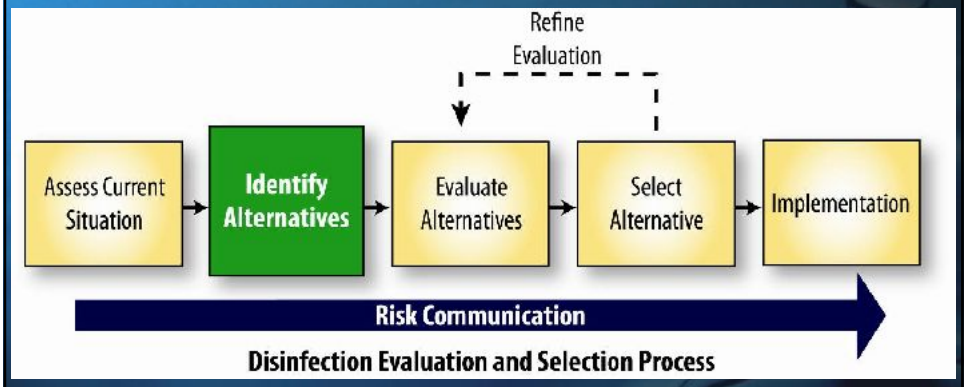
Step 2 – Identify Alternatives



Screen alternatives to identify which should be carried forward for detailed evaluation

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Step 2 – Identify Alternatives

- Eliminate alternatives with fatal flaws such as:
  - Won't meet disinfection regulatory requirements
  - Emerging/unproven technologies
  - Unreliable or excessively costly chemical supply
- Guide provides information to help do this

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Eliminate Alternatives that do not Meet Disinfection Requirements

Primary disinfectant	Secondary residual	Water Quality Criteria						
		Giardia 0.5 log	Bacteria (non-detect)	Virus 2 log	Cryptosporidium 2.5 log	TTHM Reduction	HAA5 Reduction	Taste & Odor
		Ability to Meet Water Quality Criteria						
Chlorine, gas	Chlorine, gas	Adequate	Adequate	Ideal	Poor	Adequate/Poor	Adequate/Poor	Poor
Sodium Hypochlorite	Sodium Hypochlorite	Adequate	Adequate	Ideal	Poor	Adequate/Poor	Adequate/Poor	Poor
UV / Hypochlorite	Hypochlorite	Ideal	Ideal	Adequate	Ideal	Adequate/Poor	Adequate/Poor	Poor
UV / Hypochlorite off-site	Hypochlorite + Ammonia	Ideal	Ideal	Adequate	Ideal	Ideal	Ideal	Poor
Chlorine Dioxide/Hypochlorite	Hypochlorite	Ideal	Ideal	Ideal	Adequate	Adequate/Poor	Adequate/Poor	Adequate
Ozone / Hypochlorite	Hypochlorite + Ammonia	Ideal	Ideal	Ideal	Adequate	Ideal	Ideal	Ideal
Ozone/UV / Hypochlorite	Hypochlorite + Ammonia	Ideal	Ideal	Ideal	Ideal	Ideal	Ideal	Ideal
Ozone/UV / Hypochlorite	Hypochlorite	Ideal	Ideal	Ideal	Ideal	Adequate/Poor	Adequate/Poor	Ideal

Example only – all systems will be different!

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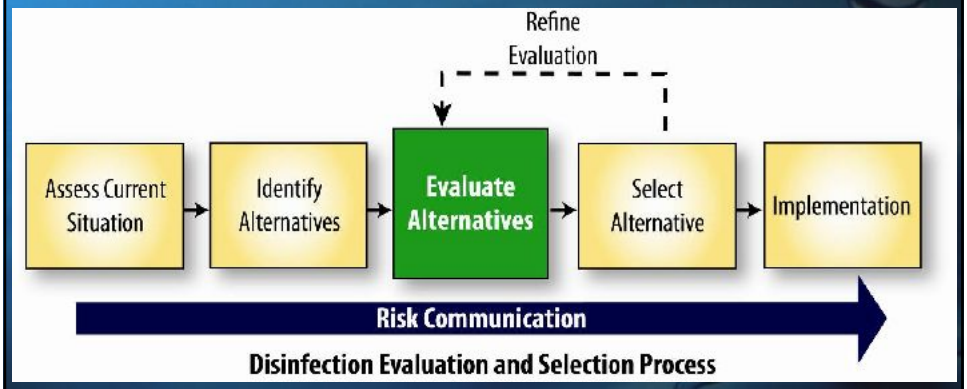
Step 3 – Evaluate Alternatives



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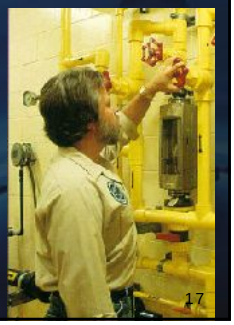
Step 3 – Evaluate Alternative – Consider and Compare Attributes

- Disinfection Efficiency
- Safety
  - Employee
  - Public
- Water Aesthetics
- Reliability
  - Operational
  - Resiliency
  - Supply chain
- Stakeholder acceptability
- Environmental
  - Carbon footprint
  - Receiving water quality
- Cost
  - Capital
  - O & M



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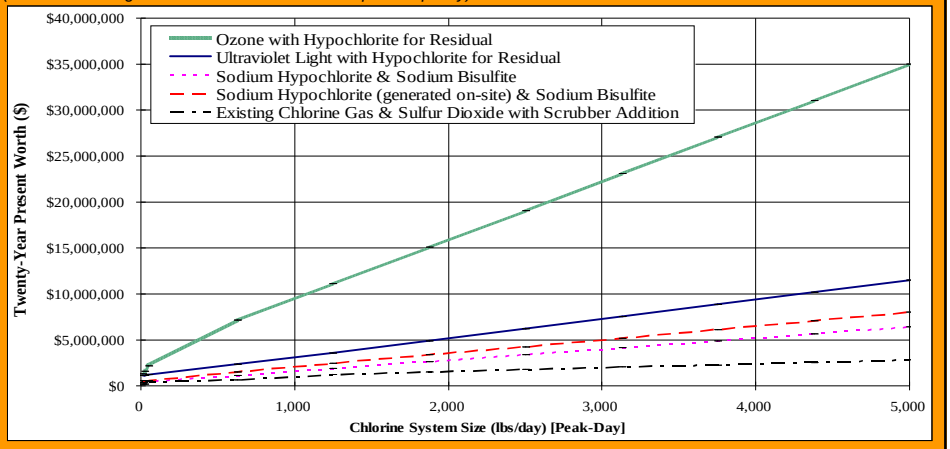
Costs will be Site Specific – Use Cost Curves with Caution

EXHIBIT 4-6
Drinking Water 20-year Present Worth
(Assumes average chlorine dose is one third of peak capacity)



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Determine Costs of Needed Security Improvements

- Sometimes costs of security improvements can impact decision
- How much security is enough?
  - What design basis threat to use?
  - Use "industry standards" and legal/liability considerations to define
  - Risk based – consequences can be defined relatively well, likelihood of attack more challenging

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Security Improvements can be Cost Effective

- Emphasize protection of chemical storage facility – not entire site
- Theft is new design threat for many
  - Consider barriers to prevent vehicle access
  - Supply chain and accounting issues

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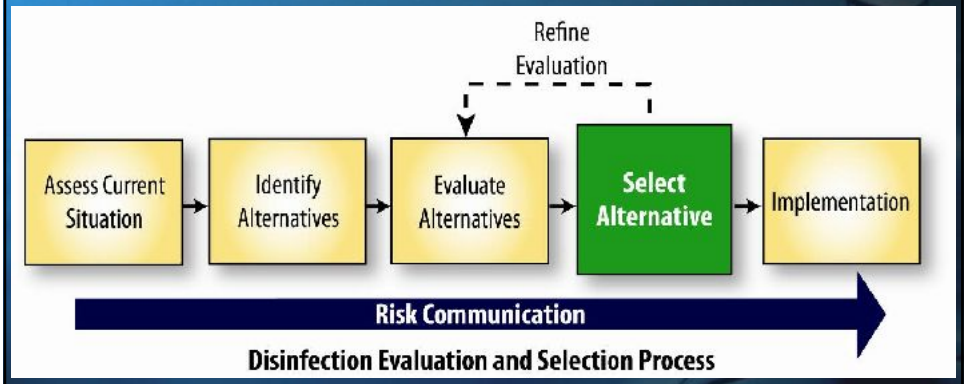
Step 4 – Select Alternative



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Decision Making Tools Help Select Alternative

- Desired attributes of decision tools
  - Use to inform, not make decisions
  - Stakeholders and decision makers can understand
  - Credible and defensible
  - Address uncertainties
  - Straightforward, and user friendly
  - But… do not over-simplify
- Guide includes examples to demonstrate use of tools

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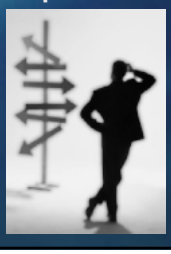
Methodologies for Making a Decision

- Guide decision-making tools
  - Trade-off Analysis
    - Multi-Attribute – Excellent for complex comparison of objective and subjective measures.
  - Risk based (Risk = likelihood x consequences)
    - Major drawback is difficulty in quantifying probability of an attack, release, or water quality event
    - Regrets analysis helps address this drawback



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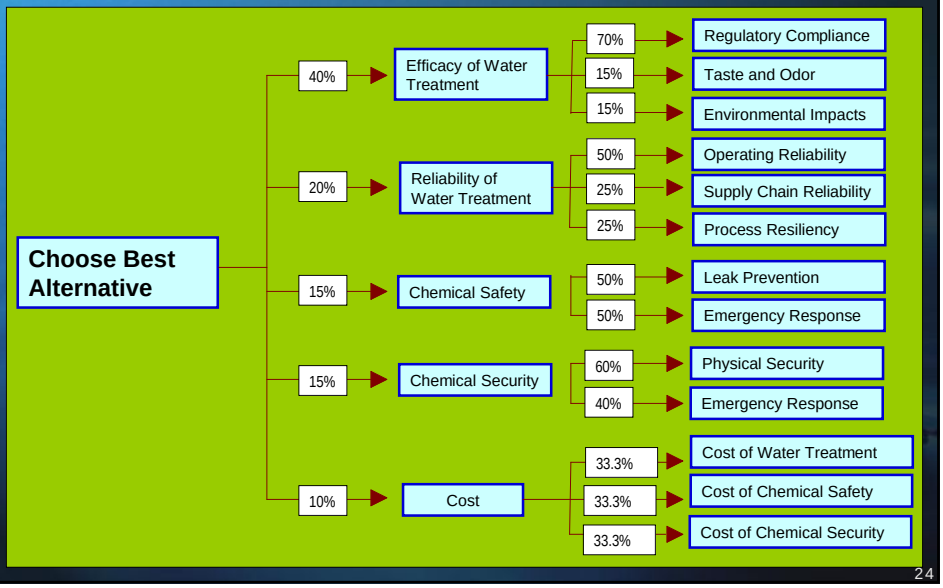
Guide Provides Background Information to Help Weight Attributes



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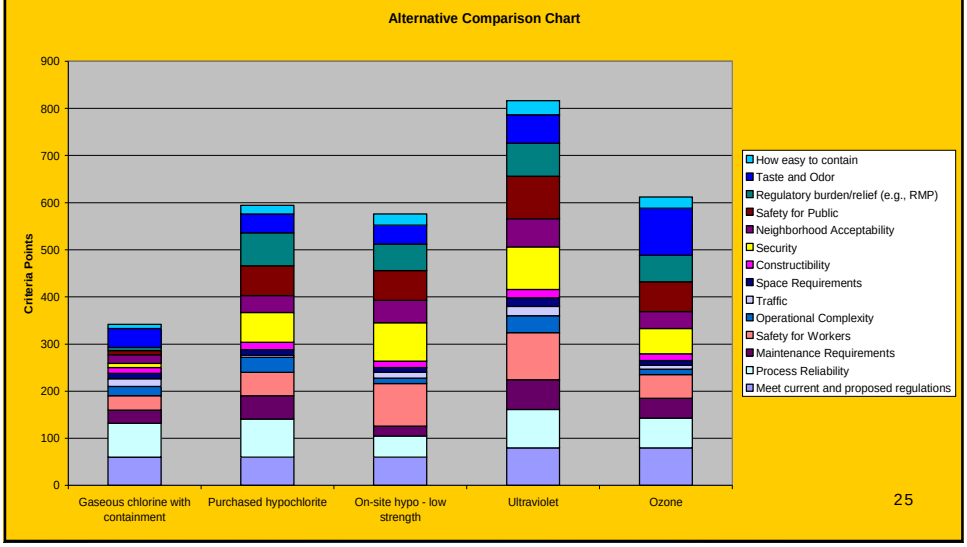
Multi-Attribute Analysis – Example Output



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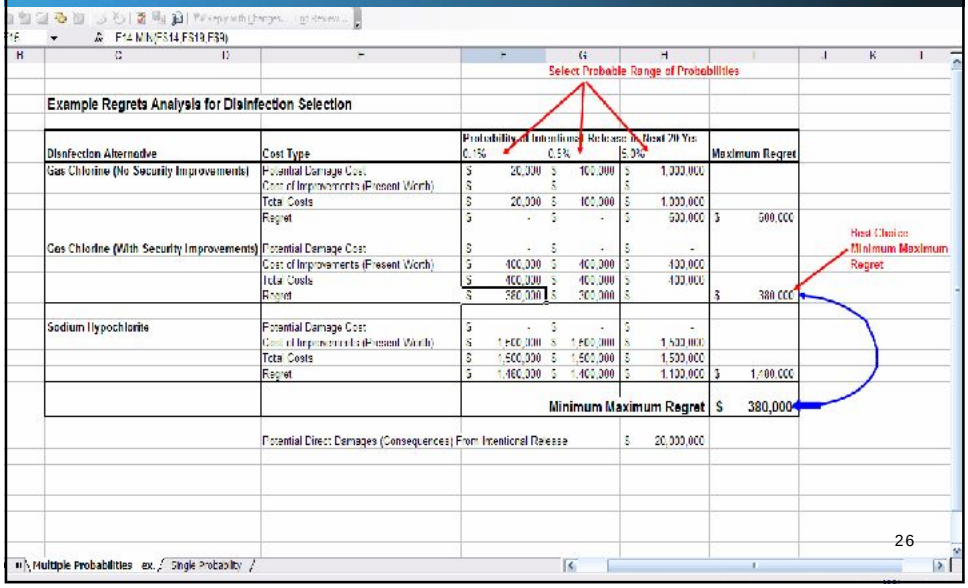
Regrets Analysis Helps Address Uncertainty of Release or Water Quality Event



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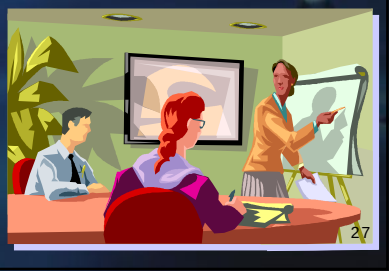
Guidance for Communication to the Public and Stakeholders

- Best practices for communicating risk
  - Communicate decisions to the public
  - Involve public in the decision
  - Consider local politics
  - Address influence of public opinion on decision makers
- Provide suggested messages to provide to the public and other stakeholders
  - Benefits of disinfection
  - Safety and security systems decrease risk
  - Put risk in perspective



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Preliminary Conclusions

- Results differ significantly depending upon local conditions
- Setting objectives for disinfection performance that consider a broad range of considerations essential
- Safety and security increasingly important aspect of the disinfection selection process

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Preliminary Conclusions – cont.

- A transparent and clear disinfection selection process facilitates communicating the true consequences of disinfectant selection to interested stakeholders
  - Governing bodies
  - Neighborhoods
  - Rate payers

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Ask the Experts

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